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SELECTED CONCEPTS, DEFINITIONS AND CLASSIFICATIONS RELEVANT TO THE
STUDY OF FERTILITY, MORTALITY AND MIGRATION

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Introduction

1. The objectives of this paper are to discuss and evaluate concepts, definitions and classifications relevant to the study of fertility, mortality and migration in Africa with a view to improving data collection efforts. Except for special concepts, no attempt has been made to provide definitions, because these have been adequately covered elsewhere. ^{1/}

2. More specifically, the approach adopted in this paper consists of reviews and critical evaluations of the usages and adaptations of fertility, mortality and migration concepts and classifications in Africa especially those employed during the course of data collection.

A. Concepts, Definitions and Classifications: Fertility

3. The selected concepts, definitions and classifications on fertility that will be examined in this section, are as follows:

- Number of children ever born alive;
- Births occurring in a specified recent period usually 12 or 24 months preceding the census or survey;
- Date of last live birth.

These questions are usually addressed to females 12 years of age and above in the majority of African countries. Other respondents that have been used for these questions include:

- females 10 years of age and above [Liberia (1974) and Malawi (1977)]
- females 15 years of age and above [Gambia (1983) Lesotho (1976) and Swaziland (1976)]
- married, widowed and divorced women [Egypt (1976) Central African Republic (1975) and Tunisia (1975)]
- females born in 1964 and before (i.e. approximately 13 years of age and above at the time of the census) (Mauritania (1976))
- women under 55 years not reported as single [Mauritius (1972)]

Congo (1974) and Burundi (1979) used both the age limit 12 years and above as well as a de jure classification of women i.e. those who were usual residents whether present or temporarily absent.

^{1/} See for example, United Nations, Principles and Recommendations for Population and Housing Censuses, (New York: 1980) ST/ESA/STAT/SER.M/67; United Nations, Principles and Recommendations for a Vital Statistics System (New York 1973) ST/ESA/STAT/SER.M/19; United Nations, Methods of Measuring Internal Migration, (New York: 1974) Population Studies No. 47 and E. Van de Walle, Multinational Demographic Dictionary: English section (Leige, Belgium: International Union for the Scientific Study of Population, 1982 2nd ed).

Number of children ever born alive

4. This is the most common question included in African censuses and surveys in recent years. It also featured in the censuses and surveys of the 1960s and 1970s. In the 1973 National Demographic Survey of Tanzania and the Kenya World Fertility Survey, a question on this topic was also included.

5. Some differences could be discerned about the phrasing and design of this question. In some countries (e.g. Angola (1981), Cameroon (1976), Congo (1974), Central African Republic (1975), Gabon (1980) and Somalia (1975) the question was asked in terms of the total number of children ever born and the total number either alive or dead, classified by sex. In others (e.g. Botswana (1981) Burundi (1979), Gambia (1983), Kenya (1979), Sierra Leone (1974), Tunisia (1975) and Lesotho (1976) the question asked in the new form i.e. the total number of children born alive was classified into the three categories: (a) living in the household, (b) living away from the household and (c) dead. In addition, some countries (e.g. Gambia, Kenya and Lesotho) required that the children in the three categories be classified by sex.

6. The main shortcoming of the information on the number of children ever born alive is that on the average it is under reported.^{2/} Omissions occur more regularly, it seems, to children borne who die soon after birth; those not living in the household at the time of the interview; and those born of a husband other than the current one. In particular, it has been noted that the average number of children increases very gradually at ages of women thirty or thirty-five and sometimes decreases at ages forty-five or fifty. This strongly points to omission of children by older women.

7. The question is also susceptible to over reporting, ^{2/} though on a reduced scale, because sometimes still births are reported as children who die in infancy. Overreporting can also occur for children borne by another wife to the current husband, adopted children and grandchildren.

8. However, the problem of dating births that bedevils fertility measures pertaining to a recent period is absent here.

Births within preceding 12 or 24 months

9. This questions has been experimented with in most of the surveys conducted under French auspices in Western and Central Africa. Recently the question has featured in the census questionnaires of, for example, Botswana (1981), Cameroon (1976), Congo (1974), Liberia (1974), Mali (1976), Mauritania (1976/77) and Somalia (1975).

^{2/} United Nations, Methods of Estimating Basic Demographic Measures from Incomplete Data; (New York, 1967), Population Studies No. 42, Manual IV, Chapter II.

^{3/} Committee on Population and Demography, Collecting Data for the Estimation of Fertility and Mortality (Washington, D.C.: National Academy Press, 1981) P. 220.

10. The question was usually directed to women 12 years of age and above or other age classes and categories enumerated for the question on children ever born. However in Cameroon (1976) Burundi (1979) and Concos (1980) the question was asked in terms of births in the household instead of births to women.

11. It is the opinion of some authors that births to women is a more concrete concept than births in the household: "Births to women represent a clear and manageable de facto concept. Alternative units of reference could obviously cause biases of predictable kinds ... If the household is the unit, events in dissolved households risk being omitted or counted twice". ^{4/}

12. Also, there were exceptions to the use of the 12 months reference period. In Mauritania (1976/77) the question referred to births that occurred within the interval of the feast of AID, which comprised the muslim lunar year. The period does not add up to exactly 12 months.

13. Similarly in Somalia (1975), the reference time period was less than a year, as it was stated to be "since the last muslim feast of AID", about seven months to the census. Also in Botswana (1981) the question was in this form: "How many children have been born alive since independence?" This comprised a period of 10½ months.

14. Cameroon (1976) adopted a novel approach to the phrasing of this question. Twelve months were the reference intervals; but in order that the enumerator (and through him the respondents) clearly recalled this period, he was required to enter both the start and the end of the interval when asking the question: "the period 9 April 1975 to 8 April 1976".

15. The main problems encountered during the administration of the question are (a) respondents are sometimes prone to include the occurrence of an event that took place outside the reference period; and (b) omit to include relevant events that took place within the period. The reasons for these mistakes emanate from confusion with the reference period.

16. The attempts by the African countries mentioned above that used concrete intervals rather than the abstract 12 months were aimed at minimizing these problems. However, in most cases they introduced errors of their own. The main problem was that the reference period selected was usually less than 12 months, which means births for the remaining period had to be prorated assuming a linear rate of growth. This was the approach used in Botswana (1981).

17. "When the number of days in a year was divided by the number of days in this period, a raising factor of 1.0992 was obtained. The seasonality patterns of births are not known, but the above method of obtaining the raising factor assumed that births and deaths occur at uniform rates throughout the year". Therefore, the technique might result in either over- or under-estimates of births, since seasonal patterns were disregarded.

4/ E. Van de Walle, "Characteristics of African Demographic Data" in W. Brass et alia, The Demography of Tropical Africa, (Princeton, N.J.: Princeton University Press, 1968) Chapter 2.

18. Moreover as Vande Walle has observed in the evaluation of the earlier experimentation with this question, it is impossible to ascertain whether respondents are more easily able to distinguish time intervals in terms of lunar months, between the period of the celebration of independence etc., compared with calendar months 5/ .

Date of last live birth

19. Recently in place of the question on births within a specified reference period, another question on date of last live birth has been included in the censuses and surveys conducted in some African countries. This question was included in the census questionnaires of Angola (1981), Burundi (1979), Gambia (1983), Kenya (1979), Lesotho (1976), Mauritius (1972), Sierra Leone (1974), Somalia (1975), Sudan (1975), Swaziland (1976), Tanzania (1978), Zambia (1980) and Zimbabwe (1982).

20. The question usually consists of two parts - the date of birth of the last live birth to be given in both months and years and whether the child survived. As births that occur in the most recent period that is up to two or three years before the census or survey are the events of interest, it is imperative that information be provided for both months and years for them.

21. In Tanzania, however in the pre-coded questionnaire used for the 1978 census, provision was made for only the year of the last live birth. Since the census took place towards the end of August, only birth for about eight months were accounted for in 1978. To get estimates of births for the 12 months prior to the census, a linear interpolation technique had to be used. As was observed with respect to the discussion on the question on births within the preceding 12 months, the use of a linear interpolation method results in either over or under estimation of births, as the formula disregards the patterns of seasonal variations of the event.

22. More generally, because this question must be asked of every woman and also because attention must focus on the last live birth, the probability for women to provide positive responses is high 6/ . In view of these considerations, this question may obtain a higher rate of reported births than the question on births within a specified period.

B. Concepts, Definitions and Classifications: Mortality

23. Most of the concepts, definitions and classifications discussed on fertility have some relevance for mortality as well. Therefore, the description that follows will emphasise subjects not previously discussed and problems of concepts, definitions and classifications peculiar to mortality. The selected concepts on mortality that will be discussed are as follows:

- Children ever born alive classified into (a) those dead and (b) surviving
- Deaths occurring in a specified recent period, usually 12 or 24 months preceding the census or survey
- Date of last death
- Paternal orphanhood

5/ Van de Walle, op. cit.

6/ UNECA and UNESCO, Manual on Demographic Sample Surveys in Africa, (September 1974), Chapter 5.

Children ever born alive - number among dead

24. It has become the practice in inquiries that when a question on children ever born is included it should be classified into two categories - (a) children surviving and (b) children dead. Because it is free of dating errors, this question is usually considered capable of improving the information on vital events. But recall lapse problems (for example, older women forgetting children that died soon after birth or those that have grown up and live away from home) have to be contended with, more so because the reference period is longer. Some of these errors can be minimized by asking for information separately for boys and girls and also about the age at the time of death.

Deaths occurring during the last 12 months

25. The question has been included since the 1950s in the censuses and surveys of African countries, although in recent years the practice is on the decline. Countries that included the question on births within a recent period, for example Botswana (1981), Cameroon (1976), Congo (1976), Liberia (1974), Mali (1976), Mauritania (1976/77) and Somalia (1975), also included a similar question about deaths. The question is susceptible to errors (mainly recall lapse and time misplacement of the events) that affect retrospective questions such as those that relate to time reference. In addition, the death question is particularly prone to problems of omissions because of the following factors: taboos about mentioning the names of dead persons; a child dying soon after birth before making an impact on the family; and the household of the deceased breaking up on the occasion of the death of say the head.

26. To minimize omissions, other details about the deceased are asked such as the sex and age. However, even with the inclusion of these other probing questions, the information derived is often considered a conservative measurement of actual rates.

Date of last death

27. The question is similar to that on fertility, namely, the women's last live birth. This question causes problems in inquiries because of the following reasons. Firstly, some omissions are bound to occur in the cases of households that disintegrate on the death of say a strategic member or by migration. Secondly, sometimes the period which respondents may be asked to recall can be quite long so that the answers are affected by recall lapse and wrong dating of the event.

28. It is the considered view of some authors that this question did not provide satisfactory results in the African countries that have used it. ^{7/} As a result its continued usage is not recommended.

29. In the 1970 and 1980 rounds of African censuses, Tunisia (1975), Burundi (1979) and Comoros (1980) included on their questionnaires. Burundi and Comoros required not just the date of the last death, but also the dates of all other deaths in the household.

^{7/} UNECA and UNESCO, op. cit. p. 51.

Paternal orphanhood 3/

30. A question (i.e. whether a person's father is alive) has been included in censuses and surveys to provide alternative estimates of adult mortality. The origins of this question emanate from dissatisfaction with other techniques for the estimations of adult mortality such as the use of single parameter model life tables selected in order to coincide with infant and child mortality estimates from the questions on cumulative mortality; along with gross under-reporting from the question on deaths within the past 12 months and intercensal survival rates compromised by misreporting.

31. In recent years, this question was included in the census questionnaires of Angola (1981), Comoros (1980), Djibouti (1983), Gambia (1983), Sierra Leone (1974), Sudan (1983), Swaziland (1976) Tanzania (1978), and Zimbabwe (1982).

32. An evaluation of African experience with the technique identified the following sources of errors - the usage of the term "father" or "mother" to designate not just natural but also foster parents. 2/ This problem can be eliminated by the inclusion of more probing questions to identify biological parents.

33. More generally, if mortality has been falling prior to the inquiry a situation existing in some African countries, estimates derived from the technique might not reflect the position at the time of the inquiry.

C. Concepts, Definitions and Classifications: Migration

34. The selected concepts, definitions and classifications on migration that will be examined in this section, are as follows:

- The concept of migrations
- Place of birth
- Duration of residence
- Place of previous residence
- Place of residence at a fixed prior date

The concept of migration

35. Migration is a multi-dimensional phenomenon whose proper description should take account of both space and time. This has created definitional and conceptual problems as distance and time are based on a continuum. Small wonder that "there is little uniformity among, and even within, countries ... in the definition of an internal migrant" 10/. With respect to space, migration

8/ J.G.C. Blacker, "The Estimation of Adult Mortality in Africa from Data on Orphanhood", Population Studies, Vol 31 No. 1 (March 1977) pp. 107-128. The technique to extract usable information from the question whether a person's mother is alive has yet to be refined.

9/ Blacker, idem.

10/ United Nations, Statistics on Internal Migrations: A Technical Report Studies in Methods, Series F No. 23 (New York: 1978).

involves simultaneously two localities: (a) an area of origin and (b) an area of destination 11/. Other spatial concepts that have been used for the definition of migration include physical distance, type of origin/destination, especially whether urban or rural and economic opportunity.

36. Usually, an internal migrant has been defined as one who crosses a geographical or political (administrative) boundary.

37. The difficulty with the temporal aspects of the definitions of migration centres around the length of stay continuously in the destination or absence from the origin. For some authors migration must involve a sustained or permanent relocation in the place of destination. For example, according to Mangalam, migration is "a relatively permanent moving away of a collectivity called migrants, from the geographical location to another..." 12/ Some aspects of population movements, for example, circulation, are not covered by this definition.

38. Other authors have argued that the time period required to qualify as a migrant should be inflexible and be determined for each individual case, taking into account the purpose of the data collection. Reference time intervals from six months up to ten years have been employed in migration surveys or censuses.

39. On the face of it, the use of physical distance appears ideal for the identification of migrations, with a move of some specified distance considered as migration. But this approach is not without problems 13/. Firstly, the information on spatial movements are not usually presented in forms that can be easily converted to distance spanned. As a matter of fact, if even the data is available, its processing and tabulation would be very formidable and probably not worth the effort.

40. A type of migration in African countries that is of great interest is rural-to-urban movements. The classification of origin and destination localities as rural/urban presents some definitional problems. One type of classification scheme frequently used is a population size threshold. Since over time rural/urban localities change status by natural increase, migration and reclassifications, analysis involving more than one time period cannot usually keep abreast of these changes. Also if respondents are asked to classify their origin localities as rural or urban, the answers invariably will be affected by memory lapse especially on the part of long-term migrants who have not kept pace with changes of various localities. Some misrepresentations of rural places as urban is also possible.

11/ W.T.S. Gould and R.M. Prothero, "Space and Time in African Population Mobility" in L.A. Kosinski and R.M. Prothero (eds) People on the Move: Studies of Internal Migration (London Methuen:1975), pp. 39-50.

12/ J.J. Mangalam, Human Migrations (Lexington, 1968) p. 5.

13/ United Nations, Methods of Measuring Internal Migration (New York 1970) Manual VI, ST/SOA/Series A/7.

41. Locations reclassifications as urban is fraught with problems in surveys, where usually the reference spatial unit is given in terms of an administrative unit (e.g. districts or provinces). ^{14/} From the information provided it is difficult to classify at the office origin locations as urban or rural since the reference units comprise entire administrative units.

42. The complexities connected with the definition of migration have increased because in addition to the criteria on distance and time, other factors have been emphasized, especially in sample surveys. These include intentions as to the permanence or temporal character of the move, changes in milieu or environment, whether with move occurs over a labour market and reasons for the move. ^{15/}

African Usages of Concepts, Classifications and Definitions

43. In many African countries, for census purposes, for which a single question on place of birth is included, a migrant is usually defined as a person whose place of enumeration is different from place of birth, typically an administrative unit. When supplementary questions such as place of usual residence, duration of residence, and place of previous residence are also included, a migrant has been defined as a person whose residence is not the same as the locality of enumeration for a time span less than his age or who lived in years in a locality different from his place of residence at the time of the census or survey.

44. Sample surveys provide the latitude for more careful definitions of migration. For example, Caldwell has suggested the following classification scheme for migrants and non-migrants. ^{16/}

- (a) Has never migrated to town
- (b) Seasonal migrants
- (c) Permanent returnee
- (d) More permanent rural-urban migrant.

^{14/} I. Masser and W.T.S. Gould, Interregional Migration in Tropical Africa (London: Institute of British Geographers).

^{15/} Gordon F. De Jong and Robert W. Gardiner (eds.) Migration Decision making (New York: Pergamon Press, 1981).

^{16/} J.C. Caldwell, African Rural-Urban Migration: The movement to Ghana's Towns (New York: Columbia University Press, 1969).

45. Similarly, Roussel (1971) has proposed both a typology of migrants as well as the delineation of residence rules to distinguish the following groups: (a) Resident-having employment, use of land/or intention to establish residence for a period of one year or more; (b) sojourners - attending school or looking for job or absent for four months or more; (c) visitors - comprise those who are away from their residence for less than four months but not for work or schooling. 17/

46. Some countries stipulate a minimum time span for a movement to qualify as migration. For example in Nigeria for a movement from one place to be called "migration", a migrant should have stayed continuously in his new area for at least 6 months before the reference date. 18/

47. This same threshold value was adopted in a rural-urban migration survey conducted in Sierra Leone (1974/75). Here a person was considered a migrant if he had resided in an area "for longer than six months". 19/

48. A shorter time span was employed in a study of Lagos: this study defined any person who has moved in or out of the sample area of Lagos for more than 31 days as a migrant.

Place of birth

49. The question on birthplace is the most widely used to acquire information on internal migration in censuses. To get the information a question such as "where was this person born?" is included, to be investigated of all persons in the census.

50. A migrant is a person that is enumerated in a place different from the place where he was born and a non-migrant is one who is enumerated in the place where he was born.

51. The magnitude of the migratory movements depends on whether it is the village, town, district, lower or highest administrative divisions that is used as the reference spatial units.

52. The advantages of this question include its ease of understanding by the respondent. The question also enables migration information to be provided by geographical units on such items as lifetime in-migration by place of origin, lifetime out-migration by place of destination.

53. The major disadvantage is that it is not time specific. This disadvantage assumes importance for various analyses on differential, assimilation and consequences of migration, as the characteristics and motivations of recent migrants (say with duration of stay of about 5 years) will definitely be different from long-term (say 10 or 15 or more years of residence).

17/ Louis Roussel "Déplacement temporaire et migrations", Demographie compte: Afrique Noire, Madagascar, Comoros Vol. 2 CESTOM/INSEE/INED (Paris: Delegation general à la recherche scientifique, 1971)

18/ UNECA Manual of Demographic concepts and definitions, Addis Ababa, 1979

19/ D. Beyelee et alia, "Rural-urban migration in Sierra Leone: Determinants and policy implications", Michigan State University, 1976, African rural employment working paper, No.13.

54. Another short-coming of the question is that it assumes a single movement directly from the locality of birth to the present destination, the area of enumeration. Also return migration cannot be inferred from the collected information.

55. Although questions on birth-place appeared on the census questionnaires of some former British colonies, these were not fully exploited for information on internal migration: "The questions on birth-place that were included in colonial censuses were treated as subordinate to questions on tribal affiliations as indicators of migration patterns and the data were not used in published tabulations, except to establish *de jure* populations for regions and to establish the total numbers born outside the region of enumeration and thereby to provide some indications of the extent of net migration". 20/

56. This applies to those areas of the country where enumeration of the population involved the completion of individual schedules, as opposed to an administrative type of count. The latter procedure was used to estimate, for example, the population of the Protectorate of Sierra Leone and thus for such areas no information on birth-place was available.

57. The birth-place question has become one of the basic sources of internal migration information from censuses conducted since independence. The question was first included in the 1960 census of Ghana; subsequently several African countries, e.g., (Sierra Leone (1963), Malawi (1966) and Tanzania (1967) followed suit.

58. While the usage of the birth-place question has become popular in many countries, certain fundamental differences could be discerned in the methods of collection, analysis and tabulation of this item, as the table below shows.

Country	Date	Form of enumeration of birthplace question	No. of specified birthplace	No. of birthplace by residence tabulation	Others
Ghana	1960	All	7 - town or village	7	
Sierra Leone	1963	All	148	148	
Malawi	1966	All	24		
Tanzania	1967	All urban; 207 rural areas	19	67	
Uganda	1969	All urban; 107 rural areas	18	21	
Kenya	1969	All urban; 107 rural areas	41	8	
Zambia	1969	All	43	43	
Ghana	1970	All	9 - town or village		

Source" 1. Masser and W.T.S. Gould, Inter-regional Migration in Tropical Africa op cit.

20/ Gould and Masser, Op. cit.

59. Differences exist in the choice of the area unit for the collection and/or tabulation of the data. In Ghana, for example, the relevant spatial units for tabulation were the seven major administrative divisions of the country, though the collected information offered the opportunity for tabulations covering smaller areal units. In Sierra Leone, the data was collected and published for the smallest administrative units, the 148 chiefdoms. In the Eastern Africa countries of Tanzania, Kenya and Uganda, the birthplace question was not asked of all population groups. Rather, portions of the country, urban/rural, were selected for this question. Therefore, the tabulated information from these countries, covered only limited spatial units.
60. Another item of variation is in the definition of the concept itself. The majority of countries define birthplace as the physical place of birth. However, a smaller number, consider the birthplace as the usual residence of the mother of the respondent. For example, in Malawi, the two types of definitions have been used. Whereas, for the 1966 population census, the birthplace was defined as the physical place of birth, for the 1977 census, it was defined as the usual residence of the person's mother at the time of birth.^{21/}
61. Given the importance of rural-urban migration in many African countries, the birthplace data has sometimes been classified for the two sectors. For example in Sudan, the place of birth for the native population was classified into rural and urban as well as nomadic, for census purposes.
62. Classification of the migration data into urban and rural origins and destinations is invaluable for studies on this topic. However, the classification scheme presents some problems especially for censuses that employ an agglomeration rather than an administrative criterion for the definition of urban. If names of localities rather than the civil divisions are entered on the census form, the coding and processing of this item would be elaborated and time consuming. In any case, these have to be classified under subgroupings such as the civil divisions for any meaningful tabulation scheme. Thus, in practice, civil divisions are used for the recording of the birthplace information. From the data it is difficult to classify the localities of origin into urban or rural.
63. In Sierra Leone, for example, the reference unit for the birthplace question for both the 1963 and 1974 censuses were the 148 chiefdoms, the smallest administrative divisions. (The names of the localities were only entered when a person did not remember the name of the chiefdom). From the information it proved difficult to classify origin places as urban or rural.
64. A similar problem occurred in Tanzania. Cleason and Egere in their study of in-migration to urban areas using the 1967 population census data, were unable to clearly distinguish rural from urban migration.^{22/}

^{21/} UNECA, Manual of Demographic Concepts and Definitions, *op cit*.

^{22/} C. Cleason and E. Egere, "Population movement in Tanzania: An Analysis of Birthplace Data in the 1967 Population Census" (Dar-es-Salaam: University of Dar-es-Salaam, 1971).

65. A minor problem for the birthplace question is accurately providing their names for members of the households who are absent at the time of the interview and about whom the respondent does not know much about, e.g., lodgers.

Place of previous residence

66. This question enables information to be acquired on the last moves of migrants. A migrant is a person whose last locality of residence is different from his/her locality of enumeration, his/her current residence. A non-migrant is a person who has lived in his/her current residence, the place of enumeration all his life.

67. The question is very similar to that on place of birth, with the major exception that it provides information on direct moves. Thus its main defect is that it is not time specific with reference to the move.

68. The question on place of previous residence has been asked in two ways in African countries. For the first type, the date of the previous census or survey, is used as the reference point. Whereas for the other version of the question, the time reference for the previous residence is specified.

69. For example in Algeria, for their 1977 census, a question was asked about locality of residence at the time of the previous census in 1966. In Zambia the time reference was a year prior to the census: "where were you living this time last year". In Tunisia for the 1975 census, a question was asked about previous place of residence in 1969, i.e., about six years prior to the 1975 census.

Duration of residence

70. Data on internal migration in a census is also provided by including a question on duration of residence, such as, "How long have you been living in this place?" Migrants consist of (a) persons born in the locality of enumeration who have resided in another locality at any time since birth; and (b) persons born outside the locality of enumeration. A non-migrant is a person who has lived in the locality of enumeration since birth.

71. Alternatively, migrants have been classified in countries that have included the duration of residence question on their census questionnaires on the basis of the birthplace question. The question on the duration of residence has been included, in these cases, in order to aid in the classification of lifetime migrants into different duration cohorts.

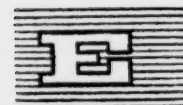
72. The advantages of this question include the possibility to acquire information on return migration and the timing of the last move.

73. The major shortcoming of this question is that it does not provide information on place of origin, thus impossible to infer about out-migration or differentiate in-migrants from immigrants.

74. The question on duration of residence allows the distribution of migrants into different temporal categories. The African experience with the use of this question include problems encountered in relating "the question of definition of duration in respect of respondents whose residence has been interrupted by periods of absence on studies or temporary assignment elsewhere. In general most African countries adopted the rule that where an absence was for less than six months at a time did not interrupt the duration of residence at any given time but where it was six months or more than this was regarded as interrupting the period of residence at the given place".^{23/} Since this question also involved dating, the problem of recall bias could compromise some answers, especially when the date of the duration of residence occurs sometime in the distant past.

^{23/} UNECA, "Study on the Methods and Problems of the 1970 Round of African Population and Housing Censuses" (Addis Ababa:1977) E/CN.14/CAS.10/15.

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The Evolution of Population Theories and
Policies in Development Planning

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The Evolution of Population Theories and
Policies in Development Planning

1. Introduction

1. The basic assumption among population scholars that all nations in the modern world which have moved from a traditional agrarian-based economic system to a predominantly industrial urbanized base have also moved from a condition of high mortality and fertility to low mortality and fertility, can be traced to the concern of Malthus for the future of human populations. Malthus and many others after him believed that the numbers of human beings would always increase up to a level set by the available food supply or by enemies and diseases. Consequently, many have asserted that uncontrolled population growth in the earth's poor countries is leading to catastrophe. A different school of thought has developed over the years which argues that the world has enough resources to cater for its population up to the end of this century and stresses that all will depend on the improvement of social and economic institutions and growth of co-operation and interdependence. Some have gone further to argue that rapid population growth has almost equalled economic growth but that high dependency and other problems associated with the former growth are due to increasing unequal distribution of income ^{1/}.

2. The continuing debate on the economic consequences of rapid population has tended to gravitate into two poles of emphasis. One of these focused on crises, systematic disasters, famine, depletion of natural resources, ecological threats linked to population growth - has adhered to the conclusions of Malthus on the ultimate catastrophe awaiting continuous growth in population. A second pole of emphasis concentrates on the inter-relationships between demographic and economic trends.

3. This debate has over the centuries been influenced by religious, political and cultural beliefs the significance of which one can identify in population policies and economic strategies adopted by different nations. In recent years interest in the relationship between economic development and population growth has given rise to evaluation of analytical theories which tend to focus overwhelmingly on the fertility and mortality factors in the process of economic and social transformation. Poor economic performance during the last quarter of a century among African countries, increasing difficulties of food supply, the persistence of high mortality and fertility and the growing difficulties of generating more employment have led to renewed interest in this debate. This paper attempts to examine the evolution of population theories and policies which have influenced development planning in the region. It uses a selected number of population

^{1/} Study committee of the office of the Foreign Secretary, National Academy of Sciences, Rapid Population Growth, Vol. II. John Hopkins Press, Baltimore 1971.

policy instruments to demonstrate how original policies have been revised, abandoned or reversed as countries have used improved demographic data on their populations to assess their socio-economic development strategies and policies. It examines the extent to which the global debate on economic-demographic interrelationships have influenced the orientation of planners in the region. It also identified continuing contradictions in some policies in the region and suggests an empirical approach to formulating population policies aimed at rationalizing economic and social development strategies.

2. Population theories which have influenced population policies in Africa

4. The majority of African countries embarked on national economic and social development planning at a time when the "demographic" transition theory as a definite statement of theory was being subjected to a complete metamorphosis by some of its authors at the Princeton Office of Population Research under Frank W. Notestein ^{1/}. The theory which specifies the relationship between socio-economic change and demographic change was first universalized by Kirk in 1944. He considered fertility decline and a regime of low vital rates as the demographic consequences of experiencing industrialization. This original social scientific perspective had produced an explanation of fertility decline and fertility level that emphasized how greatly reproductive behaviour was determined by social and structural factors. Thus transition theorists saw fertility as a dependent variable and argued that the fertility level of any society could be understood by analysing the components of its social system. The theory viewed all demographic trends as responses to structural changes labelled "the modernization process".

5. However, by the mid-1950s such scholars as Notestein and Davis had switched the theory round and made fertility an independent variable in their analysis of population dynamics in non-industrialized countries. Notestein, for example, came to consider population growth itself as a stumbling block to economic development and a cause of continuous underdevelopment. Similarly, Kingsley Davis, who in 1945 argued that "the Asiatic peoples, and others as well, will acquire modern civilization in time to check their fertility and thus achieve effective demographic balance" ^{1/} was by 1951 describing population growth in the Indian Subcontinent as "a Frankenstein" and was arguing two years later that "there was no inherent reason why peasant, agrarian populations cannot adopt the customs of fertility control, in advance of and to the advantage of modern economic development" ^{2/}. Both scholars had by then switched completely to a new policy-oriented approach which viewed fertility as an independent variable that had to be altered rather than a dependent variable that reacted to changing socio-economic conditions.

^{1/} Kingsley Davis, "The World Demographic Transition", in The Annals of the American Academy of Political and Social Sciences, 237 January, 1946, p. 10.

^{2/} D. Hodgson. "Demography as a Social Science and Policy Science", in Population and Development Review, Vol. 9, No. 1, March, 1983.

6. By the time demographers turned attention to African countries two policies were most commonly advocated for reducing rapid population growth in poor countries. The first emphasized rapid economic growth as a means of eroding the desire for fewer children. It was based on the assertion that the onset of a broad fertility decline was associated with the exposure of a substantial fraction of the population to modern systems of social, economic and value organizations. This postulation which had extensive antecedents in the original "transition" theory and in the "threshold hypothesis" fitted the political philosophical and ideological orientations of the anticolonial stance of a majority of newly independent African States. This policy orientation had lost some of its original advocates to a second theory that recommended more effective national family planning programmes, the absence of which its protagonists saw as "a major cause of the current high fertility level" of non-industrial countries 3/.

7. The issue of population policy in Africa came into general debate when advocates of the latter policy orientation had used surveys of knowledge attitudes and practices with regard to family planning (KAP surveys) and simulation models to elaborate pessimistic and optimistic scenarios of future population in developing countries 4/. While a majority of Asian countries had become converted to family planning as a national policy instrument for reducing fertility levels, the majority of African countries were not convinced of the improvement in percapita income which Coale and Hoover suggested could be realized if birth rates fell. It was, therefore, no wonder that the first attempts by Western demographers to shift the debate from a strictly social scientific stance to an explicitly policy-oriented one which identified population growth as hindering economic and social transformation were not accepted by a majority of African countries as a justification for launching a national family planning programmes.

8. During the 1960s and 1970s, demographers - particularly American demographers - used simulation models extensively to demonstrate that improvements in percapita income could only be realized if birth rates fell 5/. The general hypothesis put forward suggested that a significant feature of rapid population growth as such was that the higher the rate of population growth, the higher the level of needed investment to achieve a given percapita output. In this light, it was argued that saving was negatively related to family size. Thus, as income rises people buy more food and will have fewer babies.

3/ Dennis Hodgson, Ibid. p. 22.

4/ Bernard Berelson, ed. Family Planning and Population Programmes, University of Chicago Press, Chicago, 1969; Ansley Coale and Edgar Hoover, Population Growth and Economic Development in Low-income countries, Princeton University Press, Princeton 1958.

5/ R. G. Ridder ed., Population and Development, Johns Hopkins University Press, Baltimore, USA, 1970.

D. M. Hoer, Society and Population, Prentice Hall Inc., Englewood Cliffs, New Jersey, 1968.

Robert Repetto, Economic Equality and Fertility in Developing countries John Hopkins University Press, Baltimore, 1979.

National Academy of Science, Rapid Population Growth, Vol. I-II, John Hopkins University Press, Baltimore, 1971.

9. The African continent was invaded by family planners a majority of whom understood little about the fertility income interrelationships but who advocated population control. This "invasion" brought about a general reaction in most countries prompting many to conclude that it was neo-colonial attempt to prevent Africa from increasing its population to draw the benefits of economies of scale.

10. The emphasis on rapid population growth had focused so much attention on fertility change that population policy came to be identified with birth control and countries which had no explicit fertility regulation policies were simply classified as having no population policies. Thus, while African countries identified high mortality, morbidity, and spatial distribution as policy areas requiring urgent intervention, aid from donor countries focused principally on fertility studies related to intervention strategies for lowering current high fertility levels. This conflict of interest which was very evident during the World Population Conference in Bucharest 1974 has continued unabated to date 1/.

11. The elevation of the rapid population growth factor to the most important determinant of economic modernization led Western aid donors - particularly the USA and the World Bank to encourage the adoption of a national family planning programme as a precondition for the provision of some aid. Countries in the region reacted in two distinct ways to the pressure to view high fertility as a major obstacle to development. One group of countries, stated clearly that they needed to increase the sizes of their populations to enlarge internal markets. Thus, in 1976 Gabon, Ivory Coast, Mozambique, Central African Republic, Equatorial Guinea and the United Republic of Cameroon all advocated a higher level of natural increase in their populations 2/. Among nine countries which considered their population growth rates too high, only four (Botswana, Swaziland, Ghana, Lesotho) indicated in a UN enquiry at the time that full intervention was appropriate for lowering natural increase in population. It was easy to conclude from Government replies to the Third Inquiry that many African countries had no views regarding the acceptability of rates of natural increase for reasons ranging from insufficient information to reasons described vaguely as "other than sufficient information" 3/.

12. The inability of most African countries to state their population policies in clearly categorisable forms was nevertheless due to the poor state of knowledge of the demographic situation in these countries, a majority of which conducted their first national censuses only in the nineteen seventies. The failure of most countries in the region to be drawn easily into the "family planning before development" ideology of the new Western policy-oriented perspective of producing a specific demographic change to avert a crisis was also due to their deep-rooted mistrust of the recommendations coming from countries which were

1/ United Nations Report of the United Nations World Population Conference 1974, Bucharest, 1974, UN Sales No. E.75.X.111.3.

- World Bank, Rapid Population Growth in Sub-Saharan Africa, World Bank staff Working Papers, No. 559, Washington D.C., 1983.

2/ United Nations, World Population Trends and Policies, 1977 monitoring report Vol. II, ST/ESA/SER.A/62/Add. 1, N.Y., 1979, p. 104.

3/ UN, Ibid., p. 104

not as eager to assist purely economic development efforts as they were to fund family planning programmes.

13. The Fourth United Nations Population Inquiry among governments in 1978 and recent policy statements from African countries illustrate very significant changes in population policy orientation of countries in the region. The United Republic of Cameroon which as late as 1978 considered its population growth rate unduly low regarded it as too high in 1980 when the authorities were already describing the growth as the "spiral of uncontrolled runaway growth". Similarly, Algeria which in 1978 had regarded its growth rate as satisfactory currently considers it too high and the Central Committee of the National Liberation Front at its second regular session held in December 1979 adopted a resolution which recommended that "Activities aimed at health information and education and maternal and child protection, and the institution of a policy based on individual adherence, and consonant with our socio-cultural values, must be taken over developed and facilitated" ^{1/}. That resolution went further to state that "the rate of growth of the population if maintained, would constitute a heavy burden on the economy". Rwanda and Zimbabwe have embarked on a policy of partial intervention with a view to lowering population growth rates and in Tanzania President Nyerere called for the formulation of a national birth policy and for launching a campaign to educate people on the need for adequate spacing of children ^{2/}.

14. Countries that want lower growth rates have established goals for their population policy which specify targets to be attained within specific time periods ^{3/}. These countries have however generated more comprehensive information on the characteristics and dynamics of their populations. There appears to be a correlation between improved demographic knowledge and the formation more comprehensive population policies in the region. Thus, countries such as Nigeria with no reliable population statistics at the macro level have no specific policies of influencing growth rates.

15. While improved demographic information has contributed to the formulation of population policies in African countries, the development of research in such areas as education, female employment, health impact of family planning and maternal and child nutrition have contributed significantly to stimulating interest for sectorial policies in these areas. The influence of such research is most evident in those countries with more comprehensive populations related to birth and death rates and population distribution.

^{1/} United Nations, *Ibid.*, page 15.

^{2/} UNFPA, *Population* UNFPA Newsletter November 1982.

^{3/} Kenya wants to achieve an annual growth rate of 2.8 percent by 2000; Mauritius wants a gross reproduction rate of 1.12 during 1982-1987; Egypt wanted rate of natural increase of 1.06 percent by 1980; Tunisia is aiming at a growth rate of 1 percent by 2000, Lesotho wants a growth rate of 2 percent but the time period is not indicated and Ghana aims at a 1.8 percent growth rate by 2000.

16. Most commonly discussed, are the theories advanced by Caldwell. One of these theories argues that fertility behaviour in both high and low fertility communities is rational behaviour which is determined by social conditions - primarily by the direction of the intergenerational wealth flow. This flow, he contends is from younger to older generations in all traditional societies. He argues that unless this flow is reversed through what he calls a "Westernization" process which leads to an "emotional" and "economic" nucleation of the family, fertility is not likely to decline significantly. He also presents the general proposition that mass education (especially female education), shift in employment opportunities from family production to wage labour markets which enhance his "Westernization" process provide suitable grounds for fertility decline 1/. Although the general proposition is not dramatically different from the conventional concept of an economic price for a child which Leibenstein and Becker used to explain secular fertility decline, it nevertheless represents in part a choice for parents which the "market price" does not assume.

17. It also has far reaching policy implications which tend to re-enforce the sustenance and expansion of population policies which many governments in the African region have adhered to since independence. For example, Caldwell's advocacy of increased female education in the process of expanding mass education goes down well with national education plans in most countries of the region whether or not they aim for reduced fertility.

18. Although six countries (Central African Republic, Equatorial Guinea, Gabon, Guinea, Ivory Coast and the Libyan Arab Jamahiriya) consider their population growth rates to be too low, few policy instruments can be identified in most of these countries which sustain a high fertility policy. In some countries like the Ivory Coast, there is in fact an apparent contradiction in the country's policy. While national policy advocates the maintenance of a high growth rate, the provision of children's allowance to couples is limited to six children for a small percentage of parents in the modern economic sector.

19. In the field of mortality, the general theory that living conditions must improve all round seems to have been preceded by a period when curative medicine was believed to constitute the principal instrument of policy in this area. However, work by individual researchers and the World Health Organization has brought into the forefront a new orientation which emphasizes that preventive measures have greater long term impact on the global effort to reduce mortality and suffering. Although this new orientation has been accepted by all countries, policy makers in several African countries have continued to focus on the curative medicine which relies on expensive hospital structures. Gradually, emphasis and resources are shifting to preventive measures and it is evident that increasing resort to empirical analysis of causes of mortality as a basis for mortality reduction policies would bring preventive medicine into proper perspective in health planning.

1/ J. C. Caldwell, "Towards a restatement of demographic transition theory", population and Development Review, Volume 2, Nos. 3-4, September - December 1976, pp. 321-366.
Theory of Fertility Decline, Academy Press, New York, 1982.

20. A careful examination of population policy instruments in African countries reveals individual country adherence to systems inherited from former colonial administrations and maintained by policy makers for a wide variety of reasons. The example of French-speaking countries presents a good example of the dichotomy between population policy and existing demographic phenomenon. The social security systems in these countries are centred on a family allowance programme which was started for the elite by the colonial administration in these countries. Its origins can be traced directly from pro-natalist legislation enacted in France during the seventeenth century and carried to its fullest after French military defeats in the Prussian War, first and Second World Wars when successive French governments resolved that the French birth rate should match that of Germany.

21. The extension of the system to colonial governments limited the allowance initially to persons considered as civil servants of equal rights with the metropolitan administration. At independence, the children's allowance scheme was maintained and again limited to civil servants. Although it has been extended in varying degrees to include staff in some selected sectors of the economy, it remains a regressive tax rebate system in which persons in the higher income echelons earn more than the low income groups.

22. While the system in the English-speaking countries laid less emphases initially on children's allowance, the overall development of the social security and welfare system has also been to the detriment of the lower income groups.

23. Similarly several countries have adopted policies to provide free universal education and medical care services prior to any systematic analysis of the impact of demographic, economic, logistic and other factors crucial for the successful implementation of such policies. Thus in the countries which adopted universal free primary education for example, no plans were made to effectively absorb the great majority of its products into secondary, technical, commercial schools. The result in most cases is widespread unemployment among children sometimes as young as thirteen. In the health sector, universal free medical care policies were adopted when the majority of the population had no physical access to a clinic, health centre or hospital and when the skeletal health manpower was totally inadequate to respond even to the existing demands of the population. In this case, the results in almost all the countries have been the absence of drugs, neglect of laundry and other sanitary services of health institutions and overcrowding in these institutions. In some cases, the unintended consequence has been the emergence of private clinics which several governments then attempt to close down. In general, it can be asserted that social legislation on the continent has reflected the ideological and developmental needs of European countries whose demographic problems have for a long time been very different from the population problems that predominate in African countries.

Future orientations and new policy initiatives

24. A review of the development plans of a majority of African countries shows that although recent plans increasingly refer to demographic factors in the analysis of development problems, few utilize demographic data in formulating policies and programmes. In fact as indicated earlier in this analysis, a majority of these countries are not antinatalist and even those that support family planning policies and programmes do so for health and human rights reasons ^{1/}.

25. Among the reasons that contribute to ambivalent population policy considerations in Africa the following deserve special mention. The common and frequently repeated view that there are "empty spaces" to be filled gives most authorities the feeling that the nation has a long way to go before population problems set in. In many countries, religious, ethnic and cultural factors make population a politically sensitive subject to discuss and most authorities prefer to shelve it. Governments have been preoccupied with problems of nation building and increasing financial and economic difficulties tend to push population issues far into the background.

26. Although the practice in the recent past has been for conferences to call for greater attention to the interrelationships between population and development, it would be necessary for such recommendations and resolutions to be backed up by empirical research on these countries that demonstrate the central role of demographic variables in the development process. In this context, well-formulated and properly validated socio-economic demographic models are required to calculate the quantitative and qualitative importance of both the direct and indirect effects of changes as well as the relative costs and benefits of population policies.

27. Development planning is a mechanism for transforming development policies into a consistent design composed of instruments and quantified targets. If these policies view demographic variables as endogenous and the goals of policy makers are translated into targets, planners can determine resource requirements for each goal and thus compare the costs and benefits associated with each. To do this, it becomes necessary not to rely on generalized theories but to formulate a model that defines the critical relationships between the means and the targets. In this exercise, greater dialogue between policy makers and planners is needed for model specifications, parameter estimation and model validation.

^{1/} World Bank, 1983, op. cit. p. 56.

28. In order to make the best use of population - development models, they should be properly validated prior to being used for planning and policy formulation. Sensitivity analysis can identify those portions of the model that have the greatest effect on system response and therefore require the most careful validation. However, the usefulness of models in socio-economic demographic policy and programme formulation will depend very much on the quality of data base available because it will determine the degree to which planners can trust projections derived from it. A weak empirical base for many key relationships between social economic and demographic variables constitutes an important factor limiting the use of population development models and making planners rely on theories which bear little relevance to the actual situation in the country concern. An improvement in the quality of demographic data at the macro and micro levels is essential for viable and comprehensive population - development policies.

PRIORITIES IN THE DEVELOPMENT OF INFORMATION SYSTEMS IN AFRICA

I. INTRODUCTION

1. So far, little attention has been given by the majority of African countries to the formulation of policies, the organization and allocation of resources and the design of structures for a systematic control of the national wealth in information. It is the intention of this paper to point out certain areas that require immediate action, which if carried out within a reasonable span of time will enable information and documentation activities to pick up.

2. In attempting to identify priorities, one often has at his disposal the accumulated experience of past action serving as a guide for reassigning priorities or for drawing up altogether new directives. The case of information and documentation does not benefit from such an approach because it is essentially new to developing Africa. This does not mean that there have been no entities that have performed the task of information and documentation work in Africa. In fact, a combination of public, university, school and specialized libraries have been promoting the use of bibliographic information since colonial times using conventional methods of gathering, storing, processing and disseminating data. Moreover, the post colonial period has witnessed the proliferation of institutions, albeit to an unsatisfactory degree, that were partially engaged in the production, storage and dissemination of numerical and non-numerical data in the form of statistical abstracts, research bulletins, etc. Regardless of their objectives and functions, these mechanisms have fallen short of providing the total information requirements of present-day Africa partly as a result of the narrow scope of their target users (university libraries focusing on academics or statistical offices disseminating results of their own work alone) and partly because they have, more often than not, failed to effectively organize the nationally produced information. In the meantime, developments in the industrialized world have been progressing in a direction that has presently resulted in information and documentation systems that utilize approaches, coverage and mechanisms that are significantly different from libraries and their like. Coupled with advances in telecommunications and micro-electronics, it has now become possible to set up systems that can supply the total information requirements of a nation.

3. Although the development of information and documentation systems was first manifested in the industrialized world, its application in developing Africa poses a major problem mainly due to the drastically different social, economic and political milieu in which it is intended to be implemented. In the industrialized countries of the West, the provision of information services is basically maintained by the private sector. In the centrally planned economies, on the other hand,

the provision of information services has been carried through centralized, coordinated state apparatuses that cater to all types of national needs. The remaining body of the international community, i.e. the majority of the developing world is, even though advanced in relation to the African region, still experimenting with various types of arrangements. What Africa can learn from the outside world is thus of limited and probable value. Therefore, any identification of priority areas for the development of information and documentation systems is a combination of ideas and innovations imported from the North on the one hand, and a strategy that has yet to be tested for its suitability to the African situation on the other.

4. Another important consideration that has to be weighed prior to assessing priorities in this field is the role information is to play in the development of Africa in the short and longterm. A clear identification of its role might be considered as equivalent to identifying the broad development objectives within which information and documentation systems are going to operate and the service they are going to provide towards the attainment of stated goals. Given the present concerns, goals and objectives of African nations, one could anticipate that the Lagos Plan of Action would provide a suitable framework within which short and medium term priorities can be set for the evolution of information and documentation systems.

5. This paper continues to provide priority areas for action, particularly concerning the planning for this development of information systems; institution building measures; purpose of regional cooperation in the information field, and manpower and training priorities.

II. PRIORITIES

6. A national information policy, reflecting the needs of all sectors of the community needs to be formulated to guide the establishment of a national information plan whose elements should also be incorporated in the national development plan. Information is an essential part of a nation's resources and the formulation and implementation of a national information policy should attempt to maximize the availability and use of the country's information resources as well as promoting the exchange and sharing of information with other nations and regions to complement what is available locally from external sources.

INSTITUTION BUILDING

7. The functions of all national documentation centres and libraries should be coordinated through a central body to form a national information system or network. The creation, or where a suitable mechanism already exists, its designation as the central body responsible for the formulation of policies and the implementation of the national documentation centre is essential. In fact,

What has been indicated in the previous paragraphs cannot be attained unless an existing institution that performs a significant information and documentation activity is charged with the planning task.

8. National research councils, national planning bodies, national science councils, national libraries, development research institutes, etc. are all prospective candidates to serve as core institutions until the national documentation centre is established to take control of the responsibility. Another alternative could be the organization of a national committee/council at a high level of representation and encompassing a significant proportion of concerned State bodies. However, this latter approach would evidently delay the execution of practical programmes and loosen the institutionalized nature that is desired from the outset.

9. The selection of the institution to be responsible for initiating action and establishing the national information and documentation centre that will when fully operational, be responsible for coordinating the system of specialized information and documentation centres, libraries, etc. is extremely crucial and shall be, preferably, dealt with at high level in government. Its selection should be based on the availability of knowledgeable resource persons, infrastructural facilities and financial and material resources which it can make available to the national documentation centre until such time that the latter is integrated within the national budget and/or international assistance is made available to it.

10. Although national legislation affecting information and documentation services is, to a greater or lesser degree, available in most African countries, its strengthening and enforcement should be considered at the earliest possible date to complement what is to be done in the area of policy formulation, planning and institution building.

SUB-REGIONAL AND REGIONAL COOPERATION

11. It is apparent that information and documentation activities compete with other pressing national priorities for the allocation of budgetary resources. As a result, availability of funds, manpower and other resources have remained insufficient to maintain existing services, not to mention their expansion. The re-vitalization of existing centres or the creation of new ones to coordinate the national information and documentation activities can, therefore, succeed only if its financial outlays do not over-burden the national budget.

12. One strategy that can be recommended to keep the costs of these systems (at least, their initial costs) is to share those facilities that are by their nature prone to high initial investments or those aspects that require highly qualified manpower.

13. This argument is even more valid if seen in the context of modern information processing technologies that require both significant investments and professionally trained staff. Therefore, the promotion of sub-regional and regional cooperation in the information field shall be geared, primarily towards the attainment of this objective.

14. However, the pursuit of this advantage should not end up in an over centralized operation that deprives cooperating systems from evolving local and indigenous capabilities.

15. The same reasoning (i.e. the sharing of expensive facilities so as to reduce cost of operations) can be extended to the national level where a number of public, university and specialized libraries as well as sectoral/institutional documentation centres benefit from one central facility and a team of professionally trained practitioners (documentalists, information scientists, systems analysts).

MANPOWER AND TRAINING

16. Qualified manpower is generally accepted as being a very important element in the building up of national infrastructures. In the long term the supply of this important element should be guaranteed by integrating requirements for information manpower in the national educational structure at universities or equivalent institutions of higher education as well as by effectively organizing middle level training institutions. This long term availability of manpower is in turn dependent upon a satisfactory investigation of existing professional and non-professional personnel. The survey of available manpower can then be related in terms of number and quality to the needs indicated in the national information plan. The surveys should take into account national and international resources so that assistance can be mobilized to enable at least the minimum essential facilities for basic training to be developed at national or regional level.

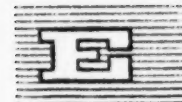
17. The national programmes should not only include initial courses and advanced studies but also specialized courses to provide for continuing education and training. Training personnel to use applied technology (including computers, reprography, telecommunications) in the field of information should be included in programmes for professional education.

18. In the short term the most pressing shortage is that of highly qualified practitioners who can initiate and subsequently manage national, sub-regional and regional systems. The shortage is not mainly of qualification since each country possesses a few outstanding librarians and other practitioners. Rather, the shortcoming seems to be in the area of professional information scientists who

are well acquainted with the diverse aspects of modern information and documentation systems. In other words, the knowledge of this category of staff should encompass documentation work, computer science and user services for non-bibliographic information, etc.

19. At the medium level, there is an urgent need to upgrade the potentials of existing information workers to enable them to effectively meet the challenge posed by the relatively new approaches, coverage, processing methods and dissemination mechanisms to be used by the national, sub-regional or regional systems.

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REVIEW OF NATIONAL DATA PROCESSING CAPABILITIES IN AFRICA

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I. INTRODUCTION

1. This report presents the results of the sixth biennial regional survey of electronic data processing (EDP) capabilities and requirements. The survey was conducted over the period of 31 January to 31 August 1983. It covered all known statistical and EDP organizational units in Africa and, like its predecessors, inquired into the related hardware and software facilities, equipment utilization, EDP personnel, and EDP staff development, and an evaluation of the EDP equipment. In addition, it sought also to establish a directory of EDP experts in the African region with a view to assessing technical assistance possibilities among countries of the region.

2. The questionnaires were addressed to 318 organizational units in 50 developing African countries. Replies were received from only 118 respondents in 33 countries as shown in table 1. The responses being far from comprehensive, indirect means such as mission reports^{1/} of EDP experts in African countries, responses of EDP equipment suppliers^{2/} to a simplified questionnaire, and the 1981 EDP survey report were also used to fill gaps whenever possible.

3. The analysis of the results of the 1983 survey takes into account the 1981 EDP survey report for only central processing units. They must therefore be interpreted with care.

Table 1. Responses to questionnaire

Sub-region	Countries ^{3/}			National Statistical Offices (NSO)			Other EDP Organizational Units			All Organizational Units		
	<u>4/ 5/ 6/</u>											
	QS	RR	%	QS	RR	%	QS	RR	%	QS	RR	%
North Africa	6	2	33	6	2	33	18	-	-	24	2	8
West Africa	16	9	56	16	8	50	105	28	27	121	36	30
Central Africa	10	6	60	10	3	30	24	8	33	34	11	32
Eastern and Southern Africa	18	16	89	18	15	83	121	54	38	139	69	50
TOTAL	50	33	66	50	28	56	268	90	34	318	118	37

4. The information obtained from the survey is presented in the provisional Directory of EDP centres (E/ECA/PSD.3/42) and in the Directory of EDP specialists (E/ECA/PSD.3/41). The tables contained in the report summarize information from the two documents. However there will be slight discrepancies between the figures contained in this report and those in the above documents which will be updated before presentation to the Joint Conference.

^{1/} For the following countries: Angola, Cape Verde, Congo, Ivory Coast, Mauritania, Sao Tome, Sudan, Uganda and Zaire.

^{2/} For the following countries: Angola, Chad, Guinea and Seychelles

^{3/} Countries which returned at least one questionnaire.

^{4/} QS = Questionnaire sent.

^{5/} RR = Questionnaire returned.

^{6/} Percentage of response rate.

II. ⁶⁵ HARDWARE AND SOFTWARE FACILITIES IN AFRICA

5. The survey inquired into the number, make and model of the central processing units available in Africa, their primary memory size, operating systems, date of acquisition as well as the nature of the tenure. It aimed also at obtaining information on characteristics of input-output devices, a description of the software facilities and an indication of the frequency of their use. Particulars were also sought on planned acquisition of additional or alternative hardware and software.

(a) Central processing units

6. The data shown in table 2 below which are available for 43 countries, may not reflect the correct distribution (absolute or percentage) of central processing units between sub-regions. This is because the number of agencies, for which information is available, is not necessarily exhaustive in respect of any country. However the data give the lower bound for the number of electronic data processing equipment being used in the region.

7. IBM was the predominant supplier of equipment with 28 per cent of the total number of computers. It was followed by ICL (15 per cent), NCR (13 per cent) and CII-HB (11 per cent). These four makes together accounted for 67 per cent of the total number of computers in use in Africa.

8. IBM was most popular in West Africa as opposed to ICL in Eastern and Southern Africa. It must be noted that at least 11 IBM computers were replaced in 1983 in West Africa by WANG's. 7/

Table 2. Estimated number of computers by make and by sub-region in 43 African countries, 1983

Make	Sub-region	North Africa			West Africa			Central Africa			Eastern and Southern Africa			Developing Africa		
		S8/ NS9/ T			S NS T			S NS T			S NS T			S NS T		
		S8	NS9	T	S	NS	T	S	NS	T	S	NS	T	S	NS	T
IBM		1	42	43	15	54	69	19	12	31	22	22	44	57	130	187
ICL		-	-	-	2	6	8	-	-	-	35	57	92	37	63	100
NCR		-	-	-	8	6	14	33	2	35	7	31	38	48	39	87
CII-HB		2	45	47	7	15	22	4	1	5	2	2	4	15	63	78
OLIVETTI		-	-	-	9	28	37	-	2	2	3	-	3	12	30	42
BURROUGHS		-	23	23	-	10	10	-	-	-	5	3	8	5	36	41
WANG		-	-	-	17	3	20	-	-	-	5	6	11	22	9	31
HEWLETT-PACKARD		-	3	3	3	-	3	4	1	5	4	2	6	11	6	17
OTHER MAKES		-	36	36	10	10	20	13	-	13	12	16	28	35	62	97
TOTAL		3	149 ^{10/}	152	71	132	203	73	18	91	25	139	241	242	438	680

9. The number of central processing units available in North Africa was definitely underestimated due to the fact that only two organizations in two countries 11/ returned the questionnaire. The data for Algeria was obtained from the document Situation de l'informatique en Algérie au 1er janvier 1982 published by the National Statistical Office. In the 1983 survey, a respondent from Morocco estimated the number of computers available in that country as at least 150.

7/ Of which nine were for use in Ghana. 8/ S = Data from the 1983 survey. 9/ NS = Non-survey data obtained from mission reports of EDP experts in African countries and also from the 1981 survey report. 10/ Data for Algeria only as at 1 January 1982. 11/ Direction de la

10. Information on the primary memory size was provided for 119 organizational units. Approximately 21 per cent of the computers had a primary memory size less than 100 K-bytes. The median primary memory size was between 100 K-bytes and 200 K-bytes.¹² The primary memory size of computers equalled or exceeded 2 megabytes in 12 organizations, as opposed to 4 in the last survey. The tendency to acquire more powerful computers which was observed in the last survey is therefore confirmed.

Table 3. Acquisition date and primary memory size (K-bytes) of central processing units in Africa, 1983

Primary Memory Size \ Acquisition date	1965-1974	1975-1979	1980	1981	1982	1983	Not stated	Planned	Total
Less than 30	13	9	2	1	-	1	10	-	36
30-49	5	9	4	4	1	-	23	-	46
50-99	7	11	5	8	3	-	25	-	59
100-299	5	20	12	9	10	5	37	1	99
300-599	4	2	3	3	2	3	10	1	28
600-999	-	-	1	3	2	1	-	-	7
1000-1999	1	3	2	1	5	5	1	-	18
2000 and over	-	-	2	1	4	2	2	1	12
Not stated	-	2	-	-	5	9	359	-	379
TOTAL	35	56	31	30	32	26	467	3	689

11. Of the 199 central processing units for which relevant information is available, 68 per cent was owned. In spite of the great number of the organizational units which did not state the types of tenure of their equipment, table 4 indicates that generally organizations prefer to own rather than rent their computers.

Table 4. Acquisition date and type of tenure of central processing units in 43 African countries, 1983

Type of Tenure \ Acquisition date	1965-1974	1975-1979	1980	1981	1982	1983	Not stated	Planned	Total
Owned	19	35	18	19	20	12	10	3	136
Rented	10	19	10	8	7	6	3	-	63
Not stated	6	2	3	3	5	8	454	-	474
TOTAL	35	56	31	30	32	26	467	3	689

12/ Office central de météorologie (Ivory Coast) 2 MB; Direction du traitement automatique de l'information (Senegal) 2MB and 8MB; Centre national de la statistique et des études économiques (Congo) 2MB; Centre Informatique (Gabon) MB; SOZACOD (Zaire) 2 MB; Botswana Government Computer Bureau (Botswana) 3.5 MB; United Nations Economic Commission for Africa (Ethiopia) 2 MB; Caltex oil (Ye va)

12. Only fifteen organizations stated the reasons for ordering additional central processing units. The reasons stated were as follows: acquisition of more powerful equipment (7 organizations), new applications (5 organizations), replacement of old equipment (2 organizations).

13. Eighty one organizations had central processing units which were located in their organizational units. The number of interactive work stations of the 48 EDP organizational units in respect of which information is available ranged from 1 to 64 with an average of 11 units.

(b) Input-output devices

14. Respondents were asked to furnish information on input-output devices as regards the device type, the make and model, the characteristics, the number of units presently used or ordered by type of tenure.

15. Information on the peripheral devices was provided by 93 organizational units. There were 1642 input-output devices in use of which 56 per cent were owned. An additional 318 devices were reported to be on order.

16. ICL was the predominant supplier of the devices in use with 34 per cent, followed by IBM (26 per cent); HP (12 per cent); ILL-IB (10 per cent); HCR (6 per cent) and WAF (5 per cent).

17. Card devices were available in 57 per cent of the reporting organizational units. They represented only 8 per cent of the total number of these devices. Paper tape equipment accounting for only 2 per cent is out of date.

18. Magnetic storage was used in 91 per cent of the organizational units, accounting for 38 per cent of the number of peripheral devices. Diskette equipment, magnetic disc units, magnetic tape units and direct data entry accounted for 14 per cent, 12 per cent, 7 per cent and 5 per cent of all these devices respectively.

19. Printing equipment was in use in 84 per cent of the organizational units for which information is available. Time printers were reported in 71 per cent of the organizational units whereas train printers, graph plotters and band printers were said to be used in 11 per cent and 2 per cent respectively. Matrix printers were also reported in 4 per cent of these organizational units.

20. Video display/terminals were available in 55 per cent of the organizational units, representing 25 per cent of the input-output devices. Modems were reported in 7 per cent of the organizational units, accounting for 5 per cent of the total number of all the peripheral devices.

Table 5. Number of input-output devices by make and device type in 93 organizational units

Make	Device type	Paper		Direct		Magn-	Magn-	Line	Train	Graph	Video		Total
		Card	Tape	Data Entry	Disk-ette	Disc Unit	Tape Unit				Dis-play Unit/term-	Mo-dem	
ICL		69	7	36	2	77	59	42	4	-	115	37	558
IBM		51	13	12	150	45	24	23	10	-	53	10	424
HP		1	-	22	-	19	5	15	-	4	89	-	191
CII-HB		3	-	-	46	13	8	3	-	-	59	18	159
NCR		4	2	-	-	11	7	8	2	-	21	2	94
WANG		-	-	6	4	11	3	6	-	-	54	2	88
OTHER		10	6	-	26	26	1	12	1	1	18	16	128
TOTAL		138	28	76	235	202	107	115	17	5	409	85	1 642

(c) Software

21. The particulars sought on software concerned the name, description of compilers, assemblers and packages used in the region as well as the frequency of their use. Information on whether such software was already available for use to the organizational units or whether it had only been ordered was also sought.

22. Information was provided by 108 organizational units in 41 countries. Sixty three per cent of these organizational units use multiprogramming. COBOL was the language most used. It was reported to be used in 66 per cent of the organizational units and very extensively in 53 per cent. Then FORTRAN, RIG, ASSEMBLY, BASIC followed with 36 per cent, 33 per cent, 27 per cent and 25 per cent respectively. PLI was reported for 8 organizational units, PLAN for 5, PASCAL for 4, ALGOL for 2, SPL and NEAR for 1 each.

23. Apart the normal utility programmes provided with computers, specific packages were reported for very few organizations. CONCENTS was said to be used in 11 organizational units, CONCOR in 9, SPSS in 8, CENTS in 6, RGSP, APIEL, TSP, GENSTAT, X-TALLY and REGRES in 2 each. Most of private commercial agencies used financial packages such as PAYROLL, PROSPER, etc. for payroll, sales, investment analysis, and billing.

24. Data base management systems were reported for 12 organizational units of which 4 statistical organizations. ^{13/} These data base management systems were RAPID, IMAGE 1000, IMAGE 3000, TOTAL, LIMS, DLI, QUERY 45. Two data base management systems were reported to be of order. Only 3 data base management systems were started to be used extensively. ^{14/}

^{13/} Centre national de la statistique et des études économiques - Congo (IMAGE 3000); Institut national de la statistique et de la démographie Haute Volta (RAPID), Central Statistical Office - Ethiopia (IMAGE 3000) and United Nations Economic Commission for Africa - Ethiopia (IMAGE 3000).

^{14/} DLI for Bong Mining Company (Liberia); TOTAL for Caltex Oil Ltd. (Kenya); IMAGE 3000 for Ethiopian Airlines, and United Nations Economic Commission for Africa (Ethiopia).

III. EQUIPMENT UTILIZATION

25. Information was sought on the various electronic data processing tasks undertaken or planned. These were classified by statistical and other types of tasks identifying separately population census, foreign trade, manpower, household survey, payroll, accounting, training and other activities. Respondents were also requested to furnish particulars on the average number of minutes performed per day, the percentage of total processing time, number of records on storage for the present applications, and commencement date as well as estimated number of records for future applications. The number and length of shifts were also requested in respect of data entry and computer operations.

26. Only 73 organizational units in 26 countries furnished information on their electronic data processing tasks and computer workload. Of these only 25 organizations were engaged on statistical work.

27. The computer time spent on statistical jobs varied enormously between organizations and countries. It ranged from 10 to 1260 minutes per day and was estimated to average 303 minutes per day. In the countries where work on population census was in progress such an activity absorbed the greatest amount of processing time, otherwise generally foreign trade, household surveys, labour statistics in that order accounted for the greatest workload on the computer. Among other tasks reported were agricultural, demographic, industrial and price statistics.

28. Training activities were reported for only 16 organizational units and the computer time devoted to them is estimated to average 125 minutes per day. This time exceeded the average for those organizational units which were formal training centres or have important in-house electronic data processing training activities.

29. Non-statistical work undertaken related mainly to payroll, accountancy and banking. Some organizations reported applications to automatic billing and stock control, sales and investment analysis. Software development was reported by only four organizational units. Computer time for non-statistical work ranged from 27 to 1406 minutes per day and was estimated to average 367 minutes per day. Most of computer time was therefore spent on non-statistical work in the region.

30. The eight-hour single shift was prevalent both in respect of data entry and computer operations staff. It represented approximately 56 per cent and 47 per cent respectively of the total number of shifts observed.

Table 6. Number and length of shifts operated in 83 organizational units in respect of data entry and computer operations staff, 1983

Number of shifts	Length (hours)								
	3	4	5	6	7	8	9	10	12
Data entry									
1 shift	-	-	-	2	7	34	4	1	-
2 shifts	-	1	1	7	9	9	-	-	-
3 shifts	-	-	-	2	-	1	-	-	-
4 shifts	-	1	-	-	-	-	-	-	-
Sub-total	-	2	1	11	16	44	4	1	-

Table 6. Number and length of shifts operated in 83 organizational units in respect of data entry and computer operations staff, 1983 (cont'd)

Number of shifts	Length (hours)								
	3	4	5	6	7	8	9	10	12
Computer operations:									
1 shift	1	-	-	4	5	18	3	3	1
2 shifts	-	1	-	5	10	13	-	1	-
3 shifts	-	-	1	1	2	4	-	-	-
4 shifts	-	-	-	2	-	-	-	-	-
Sub-total	1	1	1	12	17	35	3	4	1

IV. PERSONNEL

31. Particulars were asked on electronic data processing staff and plan for future recruitment. The main categories of staff as well as those with a statistical background were listed separately. An attempt was also made to find out the reason for planned recruitment and the expected length of service.

32. The number of electronic data processing staff was 2112 for the 89 organizational units for which data is available. Of these 29 per cent of the personnel were engaged in systems and programming, 18 per cent for computer operations and 43 per cent for data entry. Sixty five of the organizational units had systems managers, 45 per cent of whom were reported to have statistical background. On the other hand only 14 per cent of the other systems and programming staff were said to have statistical background.

Table 7. Existing EDP personnel in 89 organizational units

Category of staff	Total EDP staff	EDP staff with statistical background
A. Systems and programming staff		
Manager	75	34
Systems analyst	104	23
Analyst programmer	134	22
Software programmer	44	2
Programmer (applications)	263	29
Sub-total A	620	110
B. Computer operations staff		
Manager	51	3
Operator	337	5
Sub-total B	388	8
C. Data entry staff		
Supervisor	79	-
Operator	727	4
Other	79	-
Sub-total C	905	4
D. Off-line operations	179	-
TOTAL (A+B+C+D)	2112	112

33. Only 15 organizational units in respect of which information is available stated to have software programmers. Systems analysts and analysts/programmers were employed in 39 and 51 organizational units respectively. Thirteen of the organizational units did not have programmers at all.

34. Of the 134 electronic data processing personnel planned for recruitment 75 per cent were for systems and programming, 15 per cent for computer operations, and 9 per cent for data entry. Thus these recruitment plans confirm the demand for systems and programming staff in the region. Among the reasons most frequently stated for planned recruitment were new applications, staff turnover, lack of staff, staff's skill improvement and change of electronic data processing equipment in that order. The new personnel expected were being recruited on a permanent basis.

Table 8. Recruitment plans for EDP personnel in Africa

Category of staff	Number of organizations with plans for recruitment	Planned number of recruits
Systems and programming staff		
Manager	4	5
Systems analyst	8	15
Analyst/Programmer	14	21
Software programmer	3	8
Programmer (applications)	18	51
Other staff		
Computer operations	7	20
Data entry	6	12
Other	2	2

V. TRAINING

35. Information was sought on current and future training of electronic data processing staff by the type of training, and its location, and number of staff expected to undertake EDP training during the 1984-1987 period distinguishing between the following types of training: general EDP, programming and systems.

36. In 1983, 434 staff members of the organizational units in respect of which information is available were in training. Approximately 91 per cent of the personnel were trained within the reporting countries and 58 per cent of these trainees at commercial centres. Systems and programming personnel represented 63 per cent of the total number of trainees, reflecting the great demand for that type of personnel.

Table 9. EDP staff in training from 42 organizational units classified by location and type of training, 1983

Type of Training centre	Location	A. In own country			Sub-total (A)	B. Elsewhere			Total (A+B)
		Govt.	Commercial Centre	Other		In Africa	Else-where	Sub-total	
Systems training		18	65	18	101	2	15	17	118
General programming		16	94	16	126	1	5	6	132
Software programming		2	14	1	17	3	1	4	21
Computer operation		7	46	29	82	4	-	4	86
Data preparation		3	24	27	54	-	-	-	54
Other		-	8	5	13	-	7	7	20
TOTAL		46	251	99	396	10	28	38	434

37. Table 10 shows a very strong demand for high-level language processing staff as well as an equally strong demand for systems personnel. COBOL programming trainees accounted for 59 per cent of the total number of programming trainees in 1984, 72 per cent in 1985, 1986 and 1987.

Table 10. EDP training plans for 51 organizational units in 20 African countries, 1984-1987

Type of training	1984	1985	1986	1987
General EDP				
Introductory	66	61	73	64
Intermediate	32	41	42	18
Advanced	51	31	36	19
Programming				
COBOL	130	117	134	150
Intermediate	30	23	33	15
FORTRAN	39	22	18	19
RPG	5	-	-	-
Other	16 ^{15/}	16 ^{16/}	-	-
Systems training				
Introductory	31	30	45	41
Intermediate	35	46	41	13
Advanced	19	36	18	13
Other	10	15	13	9

^{15/} Ten trainees for TDS, 4 for PLAN and 2 for PASCAL.

^{16/} For PASCAL.

38. Twenty seven formal EDP training facilities were identified. Most of the training was however conducted in-service or at centres provided by EDP suppliers or other commercial organizations within the country.

VI. EVALUATION OF EDP EQUIPMENT

39. An evaluation of the equipment used by EDP organizational units was to be made based on the following criteria. (a) provision of staff training, (b) provision of repair service, (c) availability of consultants/experts, (d) extent of software support, (e) ease of lateral and upward conversion, (f) suitability or adequacy for statistics, (g) down time (out of order) condition.

40. This evaluation was made by 76 organizational units 19 of which were performing statistical work. Concerning the criteria used for the evaluation of equipment, the percentage of users in respect of all makes who found it good or excellent was as follows: provision of repair service (85 per cent), down time condition (68 per cent), provision of staff training (68 per cent), extent of software support (50 per cent), ease of lateral and upward conversion (47 per cent), availability of consultants or experts (45 per cent) and suitability or adequacy for statistics (40 per cent).

41. Generally the down time condition of equipment was rated the most important of the considerations in respect of all makes. Provision of repair service, provision of staff training, extent of software support, availability of consultants or experts, ease of lateral and upward conversion, and suitability or adequacy for statistics were rated in that order of importance.

VII. MISCELLANEOUS

(a) Particulars on other organizations in the country of the reporting organization

42. Respondents were requested to provide information relating to the availability of computers in other organizations in the country in addition to particulars on their own organizations. These particulars concerned the name, address of these organizational units, make, model and primary memory size of the central processing units used by them. The information sought aimed, among other things, at completing the list of African EDP organizational units for other EDP surveys. Sixty six organizational units in 21 countries furnished such information. Unfortunately this is not comprehensive enough to form the basis of a full directory of EDP centres. Thus, the document prepared (E/ECA/ISD.3/42) is to be considered as provisional only.

(b) Particulars on EDP centres performing government statistical work

43. Particulars were available for 45 organizational units performing government statistical work. Twenty one African national statistical offices had central processing units located in their own organizational units.

44. Of the 58 central processing units which were available in the organizational units, IBM was still the predominant supplier with 47 per cent. The median primary memory size of computers was between 100 k-bytes and 299 bytes. It exceeded 2 megabytes in respect of 5 of these organizational units as already stated in footnote 12.

45. In respect of computer ownership, 31 were owned against 10 which were rented; however there were 14 computers for which the type of tenure was not indicated. Of all computers reported 52 per cent were less than 5 years aged.

VIII. CONCLUSION

46. Most of African countries are provided with EDP facilities which are used, among other things, to perform government statistical work. However computer time is usually spent on non-statistical rather than statistical work. There is a tendency to acquire more powerful equipment. Generally EDP organizational units prefer to own rather than rent their equipment. The demand for systems and programming staff in the region is confirmed by the recruitment and training plans. Most of EDP training is conducted in-service or at centres provided by EDP suppliers, or at the commercial organizations within the country. Down time condition and provision of repair service seem to be the most important consideration of users in respect of all makes of equipment.

47. There is a need to strengthen co-operation in the area of electronic data processing among countries of the region in order to disseminate quickly comprehensive and up-to-date information to users. In particular, the appointment at ECA of an EDP regional adviser proficient in statistical data base management systems in addition to the one already attached to the Regional Advisory Services of Demographic Statistics will be of assistance to the region.

48. In spite of all the efforts made in undertaking the surveys on data processing capabilities in Africa, the responses rate continues to remain low. It is thus difficult to have an accurate picture of the existing situation. It is therefore desirable that the countries themselves undertake, first, the review of data processing capabilities at national level. ECA Statistics Division might then summarize easily the EDP situation in member countries. Given the increasing number of organizational units using EDP facilities in the region, the limitation of the directory of EDP centres to those which perform government statistical work or have a computer powerful enough (the lower bound of the primary memory size is to be agreed upon) may be more efficient.